

NOTE

A Parasite *Freraea montana* (Diptera: Tachinidae) and
Hyperparasite *Trichomalopsis sarcophagae* (Hymenoptera:
Pteromalidae) of an Adult Ground Beetle *Amara quenseli*
(Coleoptera: Carabidae): New Host Associations Discovered in Idaho¹

Parasites of adult Carabidae appear to be quite rare in North America. Previously reported cases involve: *Centistes laevis* (Cresson) (Hymenoptera: Braconidae), which attacks *Amara exarata* Dejean (Marsh, P. M. 1979. In Krombein, K. V. et al., eds., Smithsonian Institution Press, Washington, D.C., p. 268), *Sitophaga* spp. (Diptera: Tachinidae) parasitizing *Carabus* sp. and *Calosoma* sp., and an unidentified tachinid attacking *Pterostichus* sp. (Arnaud, P. H., Jr. 1978. U.S.D.A. Miscellaneous Publication No. 1319. U.S. Government Printing Office, Washington, D.C., pp. 21 and 44). Therefore, it was of interest when we found the remains of five dead *Amara quenseli* Schönherr with one or two empty puparia in their abdomens. Prompted by this observation, we collected 14 live, adult *A. quenseli* (Hells Gate State Park, 4 miles S. of Lewiston, Nez Perce Co., ID, 2 May 1985, T. D. Miller and J. B. Johnson) and brought them to the laboratory for observation.

When the cage was checked on 20 May 1985 three adult flies were observed. These were determined to be *Freraea montana* (Coquillet) (Diptera: Tachinidae) (formerly *Eugymnogaster* [Wood, D. M. 1987. In McAlpine, J. F. et al., eds., Agriculture Canada Monograph No. 28. Canadian Government Publishing Centre, Hull, Quebec, p. 1254]). This is the first report of a host for *F. montana* (Arnaud 1978). However, the European species, *F. gagatea* Robineau-Desvoidy is known to parasitize adult carabids, possibly including *Amara aulica* Pan-

zer (Herting, B. 1960. Monographien Zur Angewandten Entomologie 16:163 [as *F. albipennis* (Zetterstedt)]).

Amara quenseli is a holarctic species occurring across the northern U.S. and Canada (Lindroth, C. H. 1968. Opuscula Entomologica Supplement 3, p. 694). It is common in the northwestern U.S. and southwestern Canada (Hatch, M. H. 1953. University of Washington Press, Seattle, p. 128). Adults are active in dry, sandy areas with sparse vegetation throughout the summer (Lindroth 1968). *Freraea montana* is known from Maine to Ohio and west to California, Washington and Alberta (Stone, A. et al. 1965. U.S.D.A. Agricultural Handbook No. 276, p. 971). Thus, it is possible that their host-parasite relationship is specific, at least within North America.

On 1 June 1985, the cage was examined again and 11 wasps were observed. These were determined to be *Trichomalopsis sarcophagae* (Gahan) (formerly *Eupteromalus* [Kamijo, K. and E. E. Grissell. 1982. Kontyu, Tokyo 50: 76-87]). *Trichomalopsis sarcophagae* has been reported from Michigan, Kansas, Idaho, and Arizona (Burks, B. D. 1979. In Krombein, K. V. et al., eds., Smithsonian Institution Press, Washington, D.C., p. 821). The only previously reported host is *Kellymia kellyi* (Aldrich) (formerly *Blaesoxipha* [Shewell, G. E. 1987. In McAlpine, J. F. et al., eds., Agriculture Canada Monograph No. 28. Canadian Government Publishing Centre, Hull, Quebec, p. 1174]) (Diptera: Sarcophagidae) (Burks 1979), which has been reported from Ontario to Kansas and west to British Columbia and New Mexico. Members of the genus are known to attack various insects, includ-

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ing adult beetles (Stone et al. 1965). Excavation of the soil in the cage yielded a single puparium with a parasite emergence hole, but it seems unlikely that all 11 parasites emerged from a single puparium. The relative sizes of *F. montana* and *T. sarcophagae* indicate that perhaps three wasps could have emerged from a single puparium, but related species known to the authors are solitary, e.g. *T. leguminosus* (Gahan).

Voucher specimens are deposited in the collections of the U.S. National Museum (*Trichomalopsis*), the California Academy

of Sciences (*Freraea*), and the W. F. Barr Entomological Museum, University of Idaho (*Amara*, *Freraea*, and *Trichomalopsis*).

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